State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawaii 96813

April 25, 2008

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National Monument Research Permit to Dr. George Antonelis, National Marine Fisheries Service, Pacific Islands Fisheries Science Center, for Access to State Waters to Conduct Non-lethal Shark Deterrent Activities

The Division of Aquatic Resources (DAR) hereby submits a request for your authorization and approval for issuance of a Papahānaumokuākea Marine National Monument research permit to Dr. George Antonelis, Chief, Protected Species Division, NOAA, National Marine Fisheries Service, Pacific Islands Fisheries Science Center, pursuant to § 187A-6, Hawaii Revised Statutes (HRS), chapter13-60.5, Hawaii Administrative Rules (HAR), and all other applicable laws and regulations.

The research permit, as described below, would allow entry and activities to occur in the Papahānaumokuākea Marine National Monument (Monument), including the NWHI State Marine Refuge and the waters (0-3 nautical miles) surrounding the following sites:

- French Frigate Shoals

The activities covered under this permit would occur from May 15, 2008 through September 30, 2008.

The proposed activities are a follow-up on the Land Board's suggestion, in response to the applicant's 2007 PMNM permit, to find non-lethal shark deterrent methods.

INTENDED ACTIVITIES

The applicant proposes to monitor predation on Hawaiian monk seal pups by Galapagos sharks and deploy shark deterrent gear around selected French Frigate Shoals (FFS) pupping sites.

All deterrents being proposed are non-lethal, and are based on input received at a 2008 Shark Predation on Hawaiian Monk Seal Workshop or in private consultations. They include:

- Visual
    - Boat anchored in nearshore water
    - Assorted visual stimuli

- Magnetic – magnets deployed in water column at strategic access points
- Electro-magnetic – powered system that emits a low level electrical field
- Auditory – underwater speaker system to broadcast boat noise

Initially the applicant also proposed using land or boat-based lights as a visual deterrent, but that portion of the application has been withdrawn.

Boat deterrent: A small (18-20 ft) workboat would be left at Trig when personnel are not present on island. to give the impression humans are present. Motivation for this deterrent type is based on observation of a "boat effect" in previous years whereby patrolling sharks appeared to avoid small boats anchored offshore. The boat would be securely attached to both an offshoare and onshore mooring and satellite/VHF tracking of the boat would be possible in the unlikely event that it should break free.

Visual array: These are visual deterents which may include one or several of the following devices: pvc tubing, closed-cell foam tubes ("swim noodles"), fishing floats, etc. The visual stimuli are intended to either deter sharks directly or , when attached to a magnetic array (described below), warn them of the presence of other stimuli that delver an unpleasant sensation. All gear would be anchored on sand or rubble substrates where there would be no damage to coral or other Monument resources. The arrays would be deployed in such a way that each segment of the line would be far enough away from the next adjoining segment so that no entanglement hazards would be created.

Magnetic deterrents: Most in-water visual deterrents (described above) would be coupled with magnetic deterrents. Research by Dr. Eric Stroud of Shark Defense Inc. has demonstrated a measurable repellent effect of magnets on captive sharks of multiple species. Elasmobranchs (sharks, rays, and skates) have a unique sensory organ that allows them to detect electric fields in the marine environment. Animals that lack this organ (the Ampullae of Lorenzini) do not display aversive behavior in close proximity to magnetic fields, thus the use of magnets should have no effects on non-elasmobrach species within the Monument. Preliminary research and consultation indicate that Grade C8 Barium-Ferrite permanent magnets (~15.24 cm x 10.1 cm x 1.27 cm dimensions) would likely be suitable for the purposes of this project. The probable deployment method would be water column sets (magnets suspended at 40-50cm separations fixed between anchor and surface float). Spatial arrangment would possibly involve double or multidimensional arrays to optimize the deterrent effect at each locale where a system is deployed.

Electromagnetic deterrents: "Shark Shields" may be deployed at primary access channels where patrolling sharks approach Trig Island. This technology, like the magnetic deterrents, impacts the sharks Ampullae of Lorenzini which is located in the shark's snout. When the shark comes into proximity of the electromagnetic field it experieinces non-damamging but uncontrollable muscle spasms in the snout, causing it to flee the area. While the techonolgy deters the shark, it does no lasting harm. Once the shark is out of the affected area, it no longer feels the effects. The main advantage of such a system, as compared to permanent magnets, is a more powerful deterrent effect at focal sites (up to 15m from the emitter of some commercial devices vs a few

meters from magnets). As with permanent magnet systems, electromagnetic systems may be coupled with visual deterrents to achieve maximum repellent effect.

Auditory stimuli: This would consist of amplified boat noise to mimic the sound of a small boat approaching the island. As with the anchored boat, the objective would be to displace predatory sharks by imparting the impression that humans are in the vicinity. The auditory repellents would be deployed either from the islet or from a small boat anchored offshore. The projected output from the transmitter would not exceed 120db or the maximum output from a boat approaching at 24mph and passing directly overhead. Power would be supplied by a portable solar system.

While there was consensus among the experts assembled at the Workshop that visual, auditory, magnetic, and electromagnetic deterrents hold promise for deterring Galapagos sharks at FFS, realistic field trials have yet to be conducted with this species. Consequently, many aspects of this system can only be resolved during or after implementation, as field teams observe shark responses to each deterrent application and adapt the system for maximum effectiveness at each islet.

Due to the experimental nature of this project, monitoring would be required for documenting changes in shark activity at pupping sites, detecting instances of shark predation on monk seal pups, and assessing shark response to deterrent devices. The applicant proposes to conduct intensive monitoring, as multiple deterrent systems would be deployed and it would be essential that the effectiveness of each component be assessed. As part of the observation efforts, overnight camping on Tern and Trig Islands may be requested in order to collect information during dawn/dusk periods.

As part of monitoring and evaluation of this project, the applicant would periodically submit progress reports describing preliminary findings on the success of the deterrent systems. These reports will also describe any negative effects observed for each system.

The activities described above may require the following regulated activities to occur in State waters:

- ☒ Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other material on the submerged lands
- ☒ Anchoring a vessel
- ☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

REVIEW PROCESS:

The permit application was sent out for review and comment to the following scientific entities: Hawaii Division of Aquatic Resources, Hawaii Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), and United States Fish and Wildlife Service Hawaiian and

Pacific Islands National Wildlife Refuge Complex Office. The Office of Hawaiian Affairs (OHA), and the Kaho'olawe Island Reserve Commission (KIRC) were also consulted.

Comments received from the scientific community are summarized as follows:

Scientific reviews support the acceptance of this application.

Concerns and questions raised were:

1. If there would be any shark tagging or marking to identify specific animals that may be causing problems

2. If all observations would be conducted from land

3. If all deterrent equipment would be removed from State waters and land at the conclusion of the project

4. If the temporary moorings and in-water equipment would be designed to withstand sea conditions and monitored daily

Comments received from the Native Hawaiian community are summarized as follows:

Cultural reviews support the acceptance of this application.

Additional reviews and permit history:

Are there other relevant/necessary permits or environmental reviews that have or will be issued with regard to this project? (e.g. MMPA, ESA, EA) Yes ☒ No ☐
If so, please list or explain:

- An Environmental Assessment (EA) entitled "Draft Environmental Assessment for the Issuance of a Research Permit to the National Marine Fisheries Service Pacific Islands Fisheries Science Center Protected Species Division for Conducting Shark Deterrent Activities in the Papahanaumokuakea Marine National Monument" has been drafted, which issued A Finding of No Significant Environmental Impact (FONSI) for these activities.

Has Applicant been granted a permit from the State in the past? Yes ☒ No ☐
If so, please summarize past permits:

- During the past 2 years the Applicant was granted permits to conduct the following activities within the Monument: Hawaiian monk seal and cetacean research (DLNR/NWHI/07R002); and shark control activities (DLNR/NWHI/06R016 and PMNM-2007-025).

Have there been any a) violations: Yes ☐ No ☒

b) Late/incomplete post-activity reports: Yes ☐ No ☒

Are there any other relevant concerns from previous permits? Yes ☐ No ☒

RESPONSE:

1. The Applicant has stated that he is working in collaboration with researchers at the Hawaii Institute of Marine Biology to gather information on identifying specific problem-sharks. Any tagging involved in this effort would be part of HIMB's ongoing shark tagging work and would be covered under a separate permit.

2. The Applicant has stated that all observation would be from land and boats. There would be no in-water observations.

3. The Applicant has stated that all deterrent equipment would be removed at the conclusion of the project.

4. The Applicant has stated that sea conditions have been taken into consideration in the design of the deterrents. Moreover, all deployments would initially be monitored daily to ensure they were operating as expected. Thereafter, they would be monitored during the regular seal population assessment visits (3-5 days per week, depending on the site). In addition, the status of all floating deterrents would be checked as soon as possible after any unusual storm events to determine how they were affected by rough seas.

STAFF OPINION:

DAR staff is of the opinion that Applicant has properly demonstrated valid justifications for his application and should be allowed to enter the NWHI State waters and to conduct the activities therein as specified in the application with the following special instructions and conditions, which are in addition to the Papahānaumokuākea Marine National Monument Research Permit General Conditions. The following special conditions have been vetted through the legal counsel of the Co-Trustee agencies.

1. To prevent introduction of disease or the unintended transport of live organisms, the permittee must comply with the disease and transport protocol attached to this permit.

2. Tenders and small vessels must be equipped with engines that meet EPA emissions requirements.

3. Refueling of tenders and all small vessels must be done at the support ships and outside the confines of lagoons or near-shore waters in the State Marine Refuge

4. No fishing is allowed in State Waters except as authorized under State law for subsistence, traditional and customary practices by Native Hawaiians.

MONUMENT MANAGEMENT BOARD OPINION:

The MMB is of the opinion that the Applicant has met the findings of Presidential Proclamation 8031 and this activity may be conducted subject to completion of all compliance requirements. The MMB concurs with the special conditions recommended by DAR staff.

RECOMMENDATION:

"That the Board authorize and approve a Research Permit to Dr. George Antonelis, Pacific Islands Fisheries Science Center."

Respectfully submitted,

DAN POLHEMUS
Administrator

APPROVED FOR SUBMITTAL

LAURA H. THIELEN
Chairperson